

FLUORESCENT BULB CRUSHING

ANOTHER FORT CARSON POLLUTION PREVENTION SUCCESS STORY

Used fluorescent bulbs make up a considerable waste stream for military facilities. Fort Carson, CO recently began crushing used four-foot fluorescent bulbs generated by the installation and managing those bulbs as "Universal Waste" instead of as hazardous waste.

Fort Carson currently generates approximately 10,000 used fluorescent bulbs a year. The sheer volume was enough to encourage personnel from the Directorate of Environmental Compliance and Management to find cost-effective methods for disposing of these bulbs in an environmentally and economically sound manner. The Installation formerly disposed of fluorescent bulbs in cardboard containers as hazardous waste on a routine basis. This method involved a tremendous amount of labor in packaging, handling, and completing the necessary paperwork for the hazardous waste disposal. This method of handling was also extremely expensive. An initiative to test a fluorescent bulb crusher was driven by the need to find a more economic and environmentally acceptable method of handling the bulbs.

The other major hurdle for the Installation related to the permitting of bulb crushing. On 6 January 2000, the U.S. Environmental Protection Agency (EPA) added hazardous waste lamps to the federal list of universal wastes regulated under the Resource Conservation and Recovery Act (RCRA). However, most states have made their own determination as to whether bulb crushing constitutes treatment or

recycling. Until recently, Colorado considered the bulb crushing to be treatment, which required permitting as a hazardous waste. Due to the efforts of the Army Western Regional Environmental Office, and EPA representatives from Region 8, Colorado now considers bulb crushing to be a "recycling" process and therefore subject to Universal Waste rules.

Background

Used fluorescent bulbs have been a waste stream of concern for a number of years. All fluorescent bulbs contain mercury - an extremely toxic and dangerous metal that requires proper waste handling. In the past, mercury in fluorescent bulbs has been placed into municipal landfills and can lead to ground water contamination. There are two general classes of fluorescent bulbs (defined by their mercury content and disposal requirements). Older fluorescent bulbs generally contain an average of about 40 mg/l of mercury and will not pass the Toxicity Characteristic Leach Procedure (TCLP) for mercury. These bulbs are currently treated as Universal Waste in Colorado, which greatly reduces the amount of paperwork required for disposal. Newer fluorescent bulbs (such as "green tips" (one of the new generation of fluorescent bulbs)) contain an average of about 20 mg/l of mercury and generally will pass TCLP and therefore can be disposed as solid waste.

Until recently, there was conflicting guidance on the proper disposal for the different fluorescent tubes. A number of states have adopted the policy of reg-

ulating used fluorescent bulbs as Universal Waste, which allows for much more efficient handling of the waste stream. Equipment that will crush used fluorescent bulbs and greatly compact them can help tremendously in managing the bulbs. Tremendous savings in waste disposal costs, containers, and man-hours for completing paperwork can be realized by using fluorescent bulb crushers. It is believed that this process can be a highly successful pollution prevention (P2) initiative at any facility that handles large numbers of spent fluorescent bulbs.

Process

Used fluorescent bulbs are picked up daily at four different locations around Fort Carson, so that the areas are not classified as satellite accumulation points. In addition, fluorescent bulbs are received and collected at Fort Carson's Treatment Storage and Disposal Facility (TSDF), the Installation's RCRA-Part B Permitted Hazardous Waste Disposal Facility. Both older type bulbs and green tips are collected. The Universal Waste bulbs are then crushed and drummed by hazardous waste handlers daily and the green tips are disposed of in the trash. The handler continues to fill the drum until it reaches capacity, at which time it is sealed for eventual disposal.

A Standard Operating Procedure (SOP) was drafted for the process that covers specifics such as spill clean up, personal protective equipment requirements, safety procedures, and regulation references. Another safety precaution for the process relates to the equipment



Joe Tarquino, a Fort Carson Hazardous Waste disposal technician, feeds a four-foot fluorescent bulb into the bulb crusher. photo by Susan Galentine

setup, which forces the handler to change out the mercury filter on the bulb crusher after 2,400 bulbs have been crushed. The mercury filter is then disposed of as hazardous waste in accordance with RCRA guidelines and the Installation SOP.

Economics/Results

Basic data on prior process rates was gathered from the personnel at the TSDF to determine the economic feasibility of this P2 initiative. It was determined that the previous year's cost for packaging and transporting fluorescent bulbs was \$2,760. The weight of this cardboard, in addition to carrying a purchase savings, provided a cost avoidance savings of \$1,440. (No hazardous waste disposal fees were incurred for the cardboard that would have been used to contain the crushed bulbs.) The cost savings for handling the bulbs in the previous year were calculated at 15 man-days, with a total value of \$3,240 per year (assuming \$27 value per man hour). The savings from paperwork reduction was conservatively estimated at 40 man-hours with a value of \$1,080. The initial cost of the bulb-crushing machine is \$7,952 and the annual recurring costs for operating the machine are \$550. (The man-hours for operating the machine are considered within this calculation, as the man-hours for handling were calculated as a



differential between the old method of handling and the new method using the bulb crusher.) The simple undiscounted payback for this P2 initiative is slightly less than one year. This payback computation is considered to be conservative and the actual payback may be considerably lower.

In reality, the largest associated savings for this P2 initiative are found in the

reduced manpower requirements for handling the fluorescent bulbs and in the completion of the paperwork associated with the waste stream. However, there are also significant savings in the reduction of packaging materials and the amount of landfill space that will be eventually occupied. Universal Waste rules, as well as efficient bulb crushing



equipment, can significantly reduce an installation's costs for disposal.

Recently, Mercury has become a larger concern for installations with significant mercury amounts. Under the Superfund Amendment and Reauthorization Act, Section 313, Mercury totals must be evaluated for reporting. As of calendar year 2000, Mercury has been classified as a Persistent Biological Toxin and the reporting threshold for mercury was reduced to 10 pounds. Under current EPA guidance, fluorescent bulb crushers may be used on fluorescent bulbs and still maintain the exemption under Section 313. This means that the crushed bulbs do not count toward the 10-pound threshold for Section 313 reporting. With the significant cost savings associated with bulb crushing and the reduction of 313 reporting requirements, bulb crushing is proving to be a positive alternative at Fort Carson.

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The bulb crusher's mercury filter must be changed out after 2,400 bulbs have been crushed. The mercury filter itself is then disposed of as hazardous waste. photo by Susan Galentine